PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-330720
(43)Date of publication of application : 30.11.2001

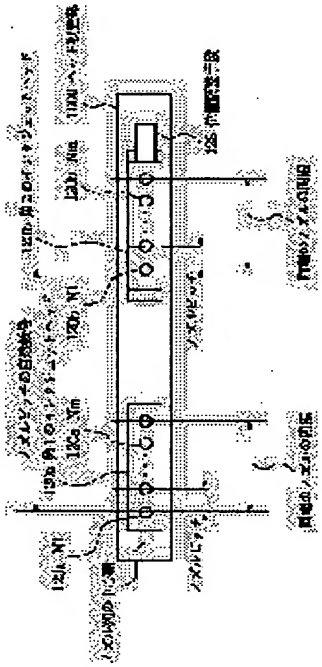
(51)Int.Cl. G02B 5/20
B41J 2/01
G09F 9/00
G09F 9/30

(21)Application number : 2000-151374
(22)Date of filing : 23.05.2000

(71)Applicant : CANON INC
(72)Inventor : SHIGEMURA YOSHIHIRO

(54) HEAD UNIT, DEVICE FOR MANUFACTURING COLOR FILTER EQUIPPED WITH THE HEAD UNIT, METHOD FOR MANUFACTURING THE SAME, METHOD FOR MANUFACTURING DISPLAY DEVICE EQUIPPED WITH COLOR FILTER, AND METHOD FOR MANUFACTURING DEVICE EQUIPPED WITH THE DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a device for the manufacture of a color filter in which even when the number of heads used is increased, the positioning time of the heads is not increased and thereby, the manufacture time can be enough reduced.
SOLUTION: The color filter is colored by using a head unit equipped with a head mount 1000 on which a plurality of ink jet heads 120a, 120b are mounted and with a position controlling means 123 which to move the ink jet head along the nozzle line direction and adjust the distance between the ink jet head 120a, 120b to the natural number times of the nozzle pitch. By this constitution, even when the number of heads used is increased, the position of the heads can be easily controlled so that the effect to reduce the manufacture time by increasing the number of heads used can be effectively made use of.



LEGAL STATUS

[Date of request for examination] 11.06.2002
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] Making the head unit and record medium possessing two or more ink jet heads scan relatively It is the head unit used for the ink jet recording device which records by giving ink on a record medium from said ink jet head. The 1st ink jet head which has the 1st ink delivery train including two or more ink deliveries, So that the 2nd ink jet head which has the 2nd ink delivery train including two or more ink deliveries, and said 1st ink delivery train and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. It has a positioning means for adjusting the relative position of said 1st ink jet head and said 2nd ink ink jet head. Said positioning means Spacing of said same direction of the 1st ink delivery of said 1st ink jet head and the 1st ink delivery of said 2nd ink jet head The head unit characterized by adjusting so that it may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head.

[Claim 2] Making the head unit and substrate possessing two or more ink jet heads scan relatively Ink is given to the coloring field on a substrate from said ink jet head. The 1st ink jet head which has the 1st ink delivery train which is the head unit used for the light filter manufacturing installation which manufactures the light filter which has two or more filter elements, and includes two or more ink deliveries, So that the 2nd ink jet head which has the 2nd ink delivery train including two or more ink deliveries, and said 1st ink delivery train and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. It has a positioning means for adjusting the relative position of said 1st ink jet head and said 2nd ink ink jet head. Said positioning means Spacing of said same direction of the 1st ink delivery of said 1st ink jet head and the 1st ink delivery of said 2nd ink jet head The head unit characterized by adjusting so that it may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head.

[Claim 3] The average value of the ink delivery pitch of said 1st ink jet head and the average value of the ink delivery pitch of said 2nd ink jet head are a head unit according to claim 1 or 2 characterized by the equal thing.

[Claim 4] When each number of nozzles of m2, the 1st [said] ink jet head, and the 2nd ink jet head is set

[the average value of the ink delivery pitch of said 1st ink jet head] to n for the average value of m1 and the ink delivery pitch of the 2nd [said] ink jet head, The difference alpha of the distance between the ends of the activity ink delivery of said 1st ink jet head, and the distance between the ends of the activity ink delivery of the 2nd ink jet head The head unit according to claim 1 or 2 characterized by being 0<alpha=|m1(n-1)-m2(n-1)| <=(micrometer) 5.

[Claim 5] When each number of nozzles of m2, the 1st [said] ink jet head, and the 2nd ink jet head is set [the average value of the ink delivery pitch of said 1st ink jet head] to n for the average value of m1 and the ink delivery pitch of the 2nd [said] ink jet head, The difference alpha of the distance between the ends of the activity ink delivery of said 1st ink jet head, and the distance between the ends of the activity ink delivery of the 2nd ink jet head The head unit according to claim 1 or 2 characterized by being 0<alpha=|m1(n-1)-m2(n-1)| <=(micrometer) 2.

[Claim 6] When each number of nozzles of m2, the 1st [said] ink jet head, and the 2nd ink jet head is set [the average value of the ink delivery pitch of said 1st ink jet head] to n for the average value of m1 and the ink delivery pitch of the 2nd [said] ink jet head, The difference alpha of the distance between the ends of the activity ink delivery of said 1st ink jet head, and the distance between the ends of the activity ink delivery of the 2nd ink jet head The head unit according to claim 1 or 2 characterized by being 0<alpha=|m1(n-1)-m2(n-1)| <=(micrometer) 1.

[Claim 7] Said positioning means is a head unit according to claim 1 to 6 characterized by adjusting so that spacing of the 1st ink delivery located in the edge of said 1st ink jet head and the 2nd ink delivery located in the edge of said 2nd ink jet head may become twice [natural number] the average of the ink delivery pitch of said 1st ink jet head.

[Claim 8] Said positioning means is a head unit according to claim 1 to 6 characterized by adjusting so that spacing of the 1st ink delivery located in the edge of said 1st ink jet head and the 2nd ink delivery located in the edge of said 2nd ink jet head may become twice [natural number] the average of the ink delivery pitch of said 2nd ink jet head.

[Claim 9] Said 1st ink jet head and said 2nd ink jet head are a head unit according to claim 1 to 8 characterized by the thing of the same color to do for the ink regurgitation.

[Claim 10] The head unit according to claim 1 to 9 characterized by preparing at least three kinds of head groups containing said the 1st ink jet head and said 2nd ink jet.

[Claim 11] Said three kinds of head groups are head units according to claim 10 characterized by being the head group which consists of an ink jet head for carrying out the regurgitation of the head group and the blue ink which consist of an ink jet head for carrying out the regurgitation of the head group and the green ink which consist of an ink jet head for carrying out the regurgitation of the red ink.

[Claim 12] Said head installation section is a head unit according to claim 11 characterized by being prepared corresponding to said three kinds of head groups, respectively.

[Claim 13] The head unit according to claim 1 to 12 characterized by measuring the impact location of the ink breathed out at least from one side of said 1st ink jet head and said 2nd ink jet head, and performing adjustment by said positioning means based on said measurement result.

[Claim 14] The head unit according to claim 1 to 13 characterized by performing adjustment by said positioning means by impressing an electrical potential difference to said positioning means.

[Claim 15] The head unit according to claim 1 to 13 characterized by performing adjustment by said positioning means by applying pneumatics to said positioning means.

[Claim 16] Making the head unit and substrate possessing two or more ink jet heads scan relatively Ink is given to the coloring field on a substrate from said ink jet head. The 1st ink jet head which has the 1st ink delivery train which is the light filter manufacturing installation which manufactures the light filter which has two or more filter elements, and includes the ink delivery of (A) plurality, (B) So that the 2nd ink jet head which has the 2nd ink delivery train including two or more ink deliveries, and the ink delivery train of the (C) above 1st and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, (D) At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. The relative position of said 1st ink jet head and said 2nd ink ink jet head A scan means to make the head unit possessing the positioning means for adjusting, and said head unit and said substrate scan relatively, It has the coloring control means controlled to make ink breathe out from two or more ink jet heads of said head unit, and to color a substrate during the relative scan by said scan means. The 1st ink delivery of said 1st ink jet head So that spacing of said same direction with the 1st ink delivery of said 2nd ink jet head may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head The light filter manufacturing installation characterized by performing adjustment by the positioning means of said head unit before coloring of said substrate.

[Claim 17] Said 1st ink jet head and said 2nd ink jet head are a light filter manufacturing installation according to claim 16 characterized by the thing of the same color to do for the ink regurgitation.

[Claim 18] The light filter manufacturing installation according to claim 16 or 17 characterized by equipping said head unit with at least three kinds of head groups containing said the 1st ink jet head and said 2nd ink jet.

[Claim 19] Said three kinds of head groups are light filter manufacturing installations according to claim 18 characterized by being the head group which consists of an ink jet head for carrying out the regurgitation of the head group and the blue ink which consist of an ink jet head for carrying out the regurgitation of the head group and the green ink which consist of an ink jet head for carrying out the regurgitation of the red ink.

[Claim 20] Said head installation section is a light filter manufacturing installation according to claim 19 characterized by being prepared corresponding to said three kinds of head groups, respectively.

[Claim 21] The light filter manufacturing installation according to claim 20 characterized by having further a migration means for moving each of said installation section prepared corresponding to the head group of each color in the array direction of said ink delivery.

[Claim 22] The light filter manufacturing installation according to claim 16 to 21 characterized by having further a revolution means for rotating each of the head installation section of each of said color to a shaft vertical to said substrate.

[Claim 23] The light filter manufacturing installation according to claim 22 characterized by enabling coloring of the coloring field on said substrate by each ink jet head of said head unit by rotating said head installation section with said revolution means after adjustment by said positioning means, and moving said installation section in the array direction of an ink delivery with said migration means further.

[Claim 24] Making the head unit and substrate possessing two or more ink jet heads scan relatively Ink is given to the coloring field on a substrate from said ink jet head. The 1st ink jet head which has the 1st ink delivery train which is the light filter manufacture approach of manufacturing the light filter which has two or more filter elements, and includes the ink delivery of (A) plurality, (B) So that the 2nd ink jet head

which has the 2nd ink delivery train including two or more ink deliveries, and the ink delivery train of the (C) above 1st and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, (D) At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. The relative position of said 1st ink jet head and said 2nd ink ink jet head The adjustment process which adjusts the head unit possessing the positioning means for adjusting, The scan process which makes said head unit and said substrate scan relatively, At said adjustment process which is equipped with the coloring process which is made to breathe out ink from two or more ink jet heads of said head unit, and colors a substrate during said relative scan, and is performed before said coloring process That adjustment is performed so that spacing of said same direction of the 1st ink delivery of said 1st ink jet head and the 1st ink delivery of said 2nd ink jet head may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head The light filter manufacture approach by which it is characterized.

[Claim 25] Said 1st ink jet head and said 2nd ink jet head are the light filter manufacture approach according to claim 24 characterized by the thing of the same color to do for the ink regurgitation.

[Claim 26] The light filter manufacture approach according to claim 24 or 25 characterized by equipping said head unit with at least three kinds of head groups containing said the 1st ink jet head and said 2nd ink jet.

[Claim 27] Said three kinds of head groups are the light filter manufacture approaches according to claim 26 characterized by being the head group which consists of an ink jet head for carrying out the regurgitation of the head group and the blue ink which consist of an ink jet head for carrying out the regurgitation of the head group and the green ink which consist of an ink jet head for carrying out the regurgitation of the red ink.

[Claim 28] Said head installation section is the light filter manufacture approach according to claim 27 characterized by being prepared corresponding to said three kinds of head groups, respectively.

[Claim 29] The light filter manufacture approach according to claim 28 characterized by having further a migration process for moving each of said installation section prepared corresponding to the head group of each color in the array direction of said ink delivery.

[Claim 30] The light filter manufacture approach according to claim 24 to 29 characterized by having further a revolution process for rotating each of the head installation section of each of said color to a shaft vertical to said substrate.

[Claim 31] The light filter manufacture approach according to claim 30 characterized by enabling coloring of the coloring field on said substrate by each ink jet head of said head unit by rotating said head installation section according to said revolution process after adjustment by said positioning process, and moving said installation section in the array direction of an ink delivery according to said migration process further.

[Claim 32] Making the head unit and substrate possessing two or more ink jet heads scan relatively It is the approach of manufacturing the display equipped with the light filter manufactured by coloring the filter element which gives ink on a substrate from said ink jet head, and functions as a light filter. The manufacture approach of the display characterized by providing the process which encloses a liquid crystal compound between the process which prepares the light filter manufactured by the manufacture approach of claim 24 thru/or either of 31, said prepared light filter, and the opposite substrate which

counters said light filter.

[Claim 33] Making the head unit and substrate possessing two or more ink jet heads scan relatively It is the approach of manufacturing equipment equipped with the display which has the light filter manufactured by coloring the filter element which gives ink on a substrate from said ink jet head, and functions as a light filter. The process which prepares the light filter manufactured by the manufacture approach of claim 24 thru/or either of 31, The process which manufactures a display by enclosing a liquid crystal compound between said prepared light filter and the opposite substrate which counters said light filter, The manufacture approach of equipment equipped with the display characterized by providing the process which connects the picture signal supply means for supplying a picture signal to this display to said display.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention breathes out ink towards a substrate by the ink jet head, and relates to the light filter manufacturing installation for manufacturing a light filter using the head unit and this head unit which are used for the equipment for manufacturing the light filter which has two or more filter elements, its manufacture approach, the manufacture approach of a liquid crystal display of having a light filter, and equipment equipped with this liquid crystal display.

[0002]

[Description of the Prior Art] In recent years, it is in a liquid crystal display and the inclination which the need of a color liquid crystal display especially increases with development of a personal computer, especially development of a portable personal computer. However, for the further spread, the cost cut of a liquid crystal display is required, and the demand to the cost cut of a light filter with specific gravity high in cost is increasing especially. Although various approaches are tried in order to meet the above-mentioned demand from the former, satisfying the demand characteristics of a light filter, the method of still satisfying all demand characteristics is not established. Below, the manufacture approach of some light filters is explained.

[0003] There is a staining technique as the manufacture approach of the 1st light filter. After a staining technique applies the water soluble polymer ingredient which is an ingredient for dyeing on a glass substrate and carries out pattern NINGU of the water soluble polymer ingredient by the photolithography method at a desired configuration, it obtains a coloring pattern by immersing the obtained pattern in a dyeing bath. The light filter layer of R(red) -G(green) -B (blue) is obtained on a glass substrate by repeating this 3 times.

[0004] There is a pigment-content powder method as the manufacture approach of the 2nd light filter, and this is an approach used. [recent years most] A pigment-content powder method forms the photopolymer layer which distributed the pigment on a glass substrate, and obtains a monochromatic pattern by carrying out patterning of this. The light filter layer of R, G, and B is formed by furthermore repeating this process each one color at a time 3 times in total.

[0005] There is an electrodeposition process as the manufacture approach of the 3rd light filter. After an electrodeposition process carries out pattern NINGU of the transparent electrode on a glass substrate, it is immersed in the electrodeposition coating liquid into which it went, such as a pigment, resin, and the electrolytic solution, in the glass substrate, and makes a desired color electrodeposit. After repeating this

process 3 times and distinguishing R, G, and B by different color with on a substrate, a coloring layer is formed on a substrate by carrying out heat curing of the resin.

[0006] There are print processes as the manufacture approach of the 4th light filter. Print processes form a coloring layer by carrying out heat curing of the resin, after distinguishing R, G, and B by different color with by repeating printing 3 times using the thing which made the resin of a heat-curing mold distribute a pigment. in addition, the above -- it is common to form a protective layer in the front face of a coloring layer also in which approach.

[0007] The point common to these four sorts of approaches needs to repeat the same process 3 times, in order to color three colors of R, G, and B, and since there are many routing counters, I hear that a yield falls and it has a fault, like cost becomes high, and there is. Furthermore, in an electrodeposition process, since the configuration of the pattern which can be formed is limited, application to the color liquid crystal display of a TFT method is difficult. moreover, since definition and smooth nature of print processes are bad, the response to detailed-izing of a pattern is difficult for them -- etc. -- it has a fault.

[0008] Then, the method of manufacturing a light filter using an ink jet method is indicated by JP,59-75205,A, JP,63-235901,A, JP,63-294503,A, or JP,1-2173202,A in order to compensate these faults. These approaches inject the ink containing the coloring matter of three colors of R (red), G (green), and B (blue) on the substrate of light transmission nature by the ink jet method, dry each ink, and form a filter element. By such ink jet method, the large cost cut effectiveness can be acquired with simplification of a production process possible [forming each filter element of R G, and B at once], and large.

[0009] By the way, when manufacturing a light filter with an ink jet method, there is the need of carrying out alignment of the head and substrate which have two or more ink deliveries to high degree of accuracy. however -- the above-mentioned official report -- actual -- many -- since its attention is not paid to productivity when producing the light filter of several sheets, it is stabilized and production of a light filter cannot be performed. That is, in the above-mentioned official report, a still inadequate point exists about mass-producing a light filter.

[0010] In order to improve these inadequate points, in JP,9-49919,A, alignment of the head and substrate which have two or more ink deliveries is carried out to high degree of accuracy, and the technique which raises the productivity of a light filter is indicated. According to this JP,9-49919,A, beforehand, among the heads of RGB3 color, since alignment of the head of other two colors is performed and he is trying to fix on the basis of the head of one color at the time of drawing, the highly precise alignment between the heads and substrates which have two or more ink deliveries can become possible, and the productivity of a light filter can be raised.

[0011]

[Problem(s) to be Solved by the Invention] Recently, enlargement of a glass substrate, enlargement of a screen size (light filter size), and highly minute-ization of a pixel are progressing with the advance of the manufacturing technology of a liquid crystal display. although the magnitude of a glass substrate was 365(mm) x460 (mm) extent conventionally -- these days -- 550mm [(mm)] x 650(mm)680(mm) x880 (mm) and 730 (mm) x -- it is expanding to 920 (mm). Also in a screen size, in connection with it, a large-sized thing is appearing every year with 10.4 inches, 12.1 inches, 13.3 inches, 14.1 inches, 15.0 inches, 17.0 inches, 18.0 inches, and 20.0 inches. Moreover, the number of pixels of a light filter is also increasing with VGA (640x480), SVGA (800x600), XGA (1024x768), SXGA (1280x1024), SXGA+ (1400x1050), UXGA (1600x1200), and QXGA (2048x1536), and high-resolution-izing of a light filter and highly minute-ization

are progressing.

[0012] Thus, when producing a big screen and the light filter which corresponded with high definition using a large-sized substrate, compared with the case where the conventional small screen and the light filter of a low resolution are manufactured, the time amount taken to produce the light filter of one sheet will become long. Then, in order to shorten more the time amount which production takes and to aim at improvement in the further productive efficiency, it is possible to make [many] the number of the heads for carrying out the regurgitation of the ink of the same color. However, using the head per piece per color to one head unit is only indicated, and when equipping one head unit with two or more heads of the same color, considering as what kind of head configuration is not indicated by JP,9-49919,A.

[0013] When manufacturing a light filter, using the head of the same color two or more, only by only using two or more heads this invention person found out that the time amount which the alignment of a head takes could be taken for a long time, and effectiveness of compaction of the production time obtained by making the number of activity heads increase could not fully be acquired, therefore improvement in the productivity of a light filter cannot fully be aimed at. Namely, since there is no semantics to which the number of heads was made to increase when the alignment between the part head takes time amount for a long time even if it makes the number of activity heads increase When the head unit equipped with two or more heads of the same color was used, this invention person noted the point that it was necessary to provide a device which does not start for a long time as for the time amount which can perform alignment between heads easily and it takes to said head unit.

[0014] Compaction of production time sufficient by this invention being made paying attention to the above-mentioned technical problem, and making it the time amount which the alignment between heads takes even if it makes the number of activity heads increase not become long is aimed at. It aims at offering the manufacture approach of equipment equipped with the light filter manufacturing installation using the head unit which can raise the productivity of a light filter, and this head unit, its manufacture approach, the manufacture approach of the display equipped with the light filter, and the display.

[0015]

[Means for Solving the Problem] This invention for attaining the above-mentioned object, making the head unit and record medium possessing two or more ink jet heads scan relatively It is the head unit used for the ink jet recording device which records by giving ink on a record medium from said ink jet head. The 1st ink jet head which has the 1st ink delivery train including two or more ink deliveries, So that the 2nd ink jet head which has the 2nd ink delivery train including two or more ink deliveries, and said 1st ink delivery train and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. It has a positioning means for adjusting the relative position of said 1st ink jet head and said 2nd ink ink jet head. Said positioning means So that spacing of said same direction of the 1st ink delivery of said 1st ink jet head and the 1st ink delivery of said 2nd ink jet head may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head adjustment It is characterized by carrying out.

[0016] Moreover, this invention, making the head unit and substrate possessing two or more ink jet heads scan relatively Ink is given to the coloring field on a substrate from said ink jet head. The 1st ink jet head which has the 1st ink delivery train which is the head unit used for the light filter manufacturing

installation which manufactures the light filter which has two or more filter elements, and includes two or more ink deliveries, So that the 2nd ink jet head which has the 2nd ink delivery train including two or more ink deliveries, and said 1st ink delivery train and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. It has a positioning means for adjusting the relative position of said 1st ink jet head and said 2nd ink ink jet head. Said positioning means So that spacing of said same direction of the 1st ink delivery of said 1st ink jet head and the 1st ink delivery of said 2nd ink jet head may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head adjustment It is characterized by carrying out.

[0017] Moreover, this invention, making the head unit and substrate possessing two or more ink jet heads scan relatively Ink is given to the coloring field on a substrate from said ink jet head. The 1st ink jet head which has the 1st ink delivery train which is the light filter manufacturing installation which manufactures the light filter which has two or more filter elements, and includes the ink delivery of (A) plurality, (B) So that the 2nd ink jet head which has the 2nd ink delivery train including two or more ink deliveries, and the ink delivery train of the (C) above 1st and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, (D) At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. The relative position of said 1st ink jet head and said 2nd ink ink jet head A scan means to make the head unit possessing the positioning means for adjusting, and said head unit and said substrate scan relatively, It has the coloring control means controlled to make ink breathe out from two or more ink jet heads of said head unit, and to color a substrate during the relative scan by said scan means. The 1st ink delivery of said 1st ink jet head So that spacing of said same direction with the 1st ink delivery of said 2nd ink jet head may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head It is characterized by performing adjustment by the positioning means of said head unit before coloring of said substrate.

[0018] Moreover, this invention, making the head unit and substrate possessing two or more ink jet heads scan relatively Ink is given to the coloring field on a substrate from said ink jet head. The 1st ink jet head which has the 1st ink delivery train which is the light filter manufacture approach of manufacturing the light filter which has two or more filter elements, and includes the ink delivery of (A) plurality, (B) So that the 2nd ink jet head which has the 2nd ink delivery train including two or more ink deliveries, and the ink delivery train of the (C) above 1st and said 2nd ink delivery train may be located in the same direction The head installation section for putting in order and installing said 1st ink jet head and said 2nd ink jet head in said same direction, (D) At least one side of said 1st ink jet head and said 2nd ink jet head is moved in the direction of said ink delivery train. The relative position of said 1st ink jet head and said 2nd ink ink jet head The adjustment process which adjusts the head unit possessing the positioning means for adjusting, The scan process which makes said head unit and said substrate scan relatively, At said adjustment process which is equipped with the coloring process which is made to breathe out ink from two or more ink jet heads of said head unit, and colors a substrate during said relative scan, and is performed before said coloring process That adjustment is performed so that spacing of said same direction of the 1st ink delivery of said 1st ink jet head and the 1st ink delivery of said 2nd ink jet head may be N times (N is the natural number) the pitch of the ink delivery of said 1st ink jet head It considers

as the description.

[0019] Moreover, this invention, making the head unit and substrate possessing two or more ink jet heads scan relatively It is the approach of manufacturing the display equipped with the light filter manufactured by coloring the filter element which gives ink on a substrate from said ink jet head, and functions as a light filter. It is characterized by providing the process which encloses a liquid crystal compound between the process which prepares the light filter manufactured by the manufacture approach of claim 24 thru/or either of 31, said prepared light filter, and the opposite substrate which counters said light filter.

[0020] Moreover, this invention, making the head unit and substrate possessing two or more ink jet heads scan relatively It is the approach of manufacturing equipment equipped with the display which has the light filter manufactured by coloring the filter element which gives ink on a substrate from said ink jet head, and functions as a light filter. The process which prepares the light filter manufactured by the manufacture approach of claim 24 thru/or either of 31, The process which manufactures a display by enclosing a liquid crystal compound between said prepared light filter and the opposite substrate which counters said light filter, It is characterized by providing the process which connects the picture signal supply means for supplying a picture signal to this display to said display.

[0021]

[Embodiment of the Invention] (1st operation gestalt) One suitable operation gestalt of this invention is hereafter explained to a detail, referring to a drawing.

[0022] [Production process-** acceptance layer type of a light filter] Drawing 1 is drawing for explaining an example of the manufacture approach of the light filter in this operation gestalt. In this operation gestalt, although the glass substrate is used as a substrate 1, if it has need properties, such as transparency as a light filter for liquid crystal, and a mechanical strength, it will not be limited to a glass substrate. For example, it is applicable with a plastic plate.

[0023] drawing 1 -- (-- a --) -- light transmission -- the section -- nine -- protection from light -- the section -- ten -- constituting -- black -- a matrix -- (-- BM --) -- two -- having had -- a glass substrate -- one -- being shown . First, on the substrate 1 with which black Matrix 2 was prepared, in itself, although it is lacking in ink receptiveness, while parent ink is formed under a certain conditions (for example, an optical exposure or an optical exposure, and heating), the resin constituent which has the property hardened under a certain conditions is applied, it prebakes if needed, and the resin constituent layer 3 is formed (drawing 1 (b)). In addition, the methods of application, such as a spin coat, a roll coat, a bar coat, a spray coat, and a DIP coat, can be used for formation of this resin constituent layer 3, and it is not especially limited to it.

[0024] Next, the part 6 (exposed part) which was made to form into parent ink a part for the resin layer by which a mask is not carried out (drawing 1 (c)), and was formed into parent ink by the resin constituent layer 3, and the part 5 (part by which the mask was carried out) which is not formed into parent ink are formed by performing pattern exposure in the resin layer on the light transmission section 9 using a photo mask 4 (drawing 1 (d)).

[0025] Then, the part 6 which turned the ink of each color of R (red), G (green), and B (blue) to the resin constituent layer 3, breathed out, and was formed into parent ink from the ink jet head is colored (drawing 1 (e)), and ink is dried further if needed. In addition, the thing of the part colored each color of R, G, and B is called filter element (pixel), and this filter element is a part which functions as a light filter.

Moreover, although the method by heat energy or the method by mechanical energy is held as an ink jet method, any method can be used suitably. Moreover, it is not restricted and what suited the transparency spectrum required [regurgitation possible ******, especially] of each pixel of R, G, and B out of various colors or a pigment as a coloring matter of ink from the ink jet head as ink to be used is chosen suitably.

[0026] Subsequently, optical exposure or optical exposure, and heat-treatment are performed, the colored resin constituent layer 3 is stiffened, and a protective layer 8 is formed in the front face if needed (drawing 1 (f)). In order to stiffen this resin constituent layer 3, different conditions from the conditions in previous parent ink-ized processing (drawing 1 (c)), for example, the light exposure in an optical exposure, are enlarged, heating conditions are changed, or the approach of using an optical exposure and heat-treatment together can be adopted.

[0027] Next, application with this operation gestalt is possible, and the manufacture approach of the above-mentioned light filter shows the different manufacture approach to drawing 2 . In addition, in drawing 2 , the thing of drawing 1 and a same sign puts the thing of the member of drawing 1 , and said division material.

[0028] Drawing 2 (a) shows the glass substrate 1 which has the light transmission section 9 and the black matrix 2 which is the protection-from-light section. First, the resin constituent which can harden with an optical exposure or an optical exposure, and heating on the substrate 1 with which the black matrix 2 was formed, and has ink receptiveness is applied, it prebakes if needed, and the resin layer 30 is formed (drawing 2 (b)). The methods of application, such as a spin coat, a roll coat, a bar coat, a spray coat, and a DIP coat, can be used for formation of this resin layer 30, and it is not especially limited to it.

[0029] The resin layer 30 of the part shaded by the black matrix 2 next, by performing pattern exposure beforehand using a photo mask 4 The part 35 (non-coloring part) which is made to harden a part of resin layer 30, and does not absorb ink is formed (drawing 2 (c)), each color of R, G, and B is colored at once using the ink jet head 120 after that (drawing 2 (d)), and ink is dried if needed.

[0030] What has opening for stiffening the protection-from-light part by the black matrix 2 as a photo mask 4 used in the case of this pattern exposure is used. Under the present circumstances, in order to prevent the color omission of the coloring agent in the part which touches the black matrix 2, it is required to give comparatively much ink. Therefore, it is desirable to use the mask 4 which has opening narrower than the width of face (protection from light) of the black matrix 2. As ink used for coloring, it is possible to use a pigment system and a pigment system, and liquefied ink and solid ink are usable.

[0031] If it has ink receptiveness and can harden as a resin constituent which is used with this operation gestalt and which can be hardened by one [at least] processing of an optical exposure or an optical exposure, and heating, either will be usable and a cellulosic or its denaturation objects, such as for example, acrylic resin, an epoxy resin, silicon resin, hydroxypropylcellulose, hydroxyethyl cellulose, methyl cellulose, and a carboxymethyl cellulose, etc. will be mentioned as resin.

[0032] In order for these resin to advance crosslinking reaction with light or light, and heat, it is also possible to use a photoinitiator (cross linking agent). As a photoinitiator, dichromate, a bis-azide compound, a radical system initiator, a cation system initiator, an anion system initiator, etc. are usable. Moreover, these photoinitiators can be mixed or it can also be used combining other sensitizers. Furthermore, it is also possible to use together photo-oxide generating agents, such as an onium salt, as a cross linking agent. In addition, in order to advance crosslinking reaction more, you may heat-treat after an optical exposure.

[0033] The resin layer containing these constituents is dramatically excellent in thermal resistance, a water resisting property, etc., and can bear enough the elevated temperature or washing process in an after process.

[0034] Moreover, as an ink jet method used with this operation gestalt, the bubble jet (trademark) type which used the electric thermal-conversion object as an energy generation component, or the piezo jet type using a piezoelectric device is usable, and coloring area and a coloring pattern can be set as arbitration.

[0035] Moreover, although this example shows the example by which the black matrix 2 was formed on the substrate, even if formed on a resin layer after [after this black matrix's forming the resin constituent layer which can be hardened] coloring, there is especially no problem and that gestalt is not limited to this example. Moreover, although it is desirable to form a metal thin film by the spatter or vacuum evaporationo on a substrate 1, and to carry out patterning according to a FOTORISO process as the formation approach, it is not limited to this.

[0036] Subsequently, only heat treatment performs optical exposure and heat treatment, and only an optical exposure stiffens the resin constituent which can be hardened (drawing 2 (e)), and forms a protective layer 8 if needed (drawing 2 (f)). In addition, hin drawing nu shows luminous intensity and, in heat treatment, heat is applied instead of the light of hnu. Moreover, it is usable, if it can form, using the 2nd resin constituent a photo-curing type, a heat-curing type, or light-and-heat concomitant use type as a protective layer 8, or it can form by vacuum evaporationo or the spatter using an inorganic material, it has the transparency at the time of considering as a light filter and a subsequent ITO formation process, an orientation film formation process, etc. can be borne enough.

[0037] In addition, in above-mentioned drawing 1 and the example of drawing 2 , although the case where the resin constituent layer 30 for receiving ink is formed on a glass substrate is explained, this invention is not limited to this, but on the direct glass substrate 1, may give ink and may form each filter element (pixel). This is explained below, referring to drawing 3 .

[0038] [Production process-** acceptance layer loess type of a light filter Application with this operation gestalt is possible for drawing 3 , and the manufacture approach of the above-mentioned light filter shows the different manufacture approach.] In addition, in drawing 3 , the thing of drawing 1 and a same sign puts the thing of the member of drawing 1 , and said division material.

[0039] Drawing 3 (a) forms the septum 12 which has ** ink nature on the substrate 1 of light transmission nature, and shows the process which gives hardenability ink 14 by the ink jet head (120, 121, 122). In this invention, a septum 12 is a member prepared in order to prevent the color mixture of the ink of a color which forms the crevice which receives hardenability ink 14, and is different between adjoining light filters. Although a septum 12 can carry out patterning for example, of the photosensitive resist and can form it easily, it can also make this septum serve a double purpose with a black matrix or a black stripe, and should just carry out patterning of the black resist in that case.

[0040] In this invention, although a septum 12 may be directly formed on the light transmission nature substrate 1, you may form on the substrate, for example, the active-matrix substrate which produced the TFT array, in which the layer which has other functions if needed was formed. In order to raise the diffusibility of hardenability ink in any case, a certain surface treatment may be performed to a light filter forming face front face.

[0041] The hardenability ink 14 used for this invention is ink hardened according to an optical exposure,

heat treatments, or these concomitant use. As hardenability ink 14, liquefied ink and solid ink are usable, and both a pigment system and a color system can be used. In ink 14, the resinous principle hardened according to an optical exposure, heat treatments, or these concomitant use, color material, an organic solvent, and water are contained.

[0042] As a hardening component, commercial resin and a commercial curing agent can be used and, specifically, acrylic resin, epoxy system resin, melamine resin, etc. are used suitably.

[0043] After giving hardenability ink 14 to each filter element (drawing 3 (b)), desiccation processing is performed if needed, according to an optical exposure, heat treatments, or these concomitant use, ink is hardened and a light filter is formed (drawing 3 (c)). Then, a protective coat 8 is formed if needed (drawing 3 (d)).

[0044] [Explanation of a light filter] Next, the color pattern of the light filter manufactured in this operation gestalt is shown in drawing 10 . By coloring the coloring section which is an abbreviation rectangle in the ink of each color of R(red) -G(green) -B (blue), two or more filter elements (pixel) are formed. The direction of Y is [150 micrometers and the direction of X of the magnitude of the one coloring section 46 (46a, 46b, 46c)] 60 micrometers. In addition, the longitudinal direction of the coloring section is the direction of Y, and said direction of Y and the direction which goes direct are the directions of X. Moreover, the coloring section located in a line in the direction of Y is colored the same color, and the coloring section located in a line in the direction of X is colored so that it may become the color from which an adjacent color differs. The direction of X and the direction of Y of a pixel pitch are 264 micrometers. As the number of a pixel is 600 pieces and is shown in the direction of X in 800 pieces and the direction of Y at drawing 11 , the size (screen size) of a light filter is 211.2mmx158.4mm, and the liquid crystal panels of 10.4 inch SVGA whose die length of the diagonal line is 264.0mm are supported. Here, the size of a light filter is the size of the display when building a light filter into a TFT-liquid-crystal panel.

[0045] In addition, it cannot be overemphasized that the light filter which can be manufactured in this operation gestalt is not limited to the light filter of the number of pixels as shown in drawing 10 and drawing 11 , or a screen size. For example, as the number of pixels, VGA (640x480), XGA (1024x768), SXGA (1280x1024), SXGA+ (1400x1050), UXGA (1600x1200), QXGA (2048x1536), etc. can also manufacture light filters, such as 12.1 inches, 13.3 inches, 14.1 inches, 15.0 inches, 17.0 inches, 18.0 inches, and 20.0 etc. inches, as a screen size.

[0046] Moreover, various color patterns (mosaicism, delta mold, etc.) as not limited to a stripe mold as shown in drawing 10 about a color pattern (pixel pattern array) and shown in drawing 12 with this operation gestalt can be manufactured.

[0047] [Color liquid crystal display incorporating a light filter] Next, the liquid crystal display manufactured by using the light filter formed with this operation gestalt is explained. In addition, drawing 4 thru/or drawing 6 are the sectional views showing the basic configuration of the screen for a display of the color liquid crystal display 30 incorporating a light filter.

[0048] 11 -- a polarizing plate and 1 -- transparence substrates, such as glass, and 2 -- a black matrix and 3 -- a resin constituent layer (ink absorbing layer) and 8 -- a protective layer and 16 -- a common electrode and 17 -- for the orientation film and 20, as for a glass substrate and 22, a pixel electrode and 21 are [the orientation film and 18 / a liquid crystal compound and 19 / a polarizing plate and 23] back light light. 54 is a light filter and 24 is an opposite substrate. Although the case where the light filter here obtained by the manufacture approach shown by drawing 1 is used is explained, it cannot be overemphasized that the

light filter obtained by the manufacture approach of drawing 2 or drawing 3 may be used.

[0049] The color liquid crystal display 30 of this operation gestalt sets the opposite substrate 24 by the light filter 54, and is formed by enclosing the liquid crystal compound 18. Inside a substrate 21, TFT (un-illustrating) and the transparent pixel electrode 20 are formed in the shape of a matrix in a liquid crystal display. Moreover, inside another substrate 1, the light filter 54 which the charge of color material of R, G, and B arranges in the location which counters a pixel electrode is installed, and the transparent counterelectrode 16 is formed on it at the whole surface. It is formed in the TFT substrate side which counters in a black matrix ONAREI type liquid crystal panel although the black matrix 2 is usually formed in the light filter substrate 1 side (refer to drawing 4) (refer to drawing 5). Furthermore, the luminous-intensity-distribution film 19 is formed in the field of both substrates, and a liquid crystal molecule can be made to arrange in the fixed direction by carrying out rubbing processing of this. Moreover, polarizing plates 11 and 22 have pasted the outside of each glass substrate, and the clearance (about 2-5 micrometers) between these glass substrates is filled up with the liquid crystal compound 18. Moreover, generally as a back light, the combination of a fluorescent lamp and a scattered plate is used, and it displays by operating a liquid crystal compound as an optical shutter to which the permeability of back light light is changed.

[0050] Moreover, there is no coloring section (filter element) which constitutes a light filter, and as shown in drawing 6 , it forms the coloring section (filter element) on the pixel electrode 20, and you may make it operate it as a light filter by what is limited to being formed on a glass substrate.

[0051] The example at the time of applying such a liquid crystal display to an information processor is explained with reference to drawing 7 thru/or drawing 9 .

[0052] Drawing 7 is the block diagram showing the outline configuration at the time of applying the above-mentioned liquid crystal display to a word processor, a personal computer, facsimile apparatus, and the information processor that has a function as a reproducing unit.

[0053] Among drawing, they are the control section which controls the whole equipment, and 1801 are equipped with CPUs and various I/O Ports, such as a microprocessor, and a control signal, a data signal, etc. are outputted to each part, or they are controlling by inputting the control signal and data signal from each part. 1802 is a display and the image data read by various menus, document information, and the image reader 1807 is displayed on this display screen. 1803 is the transparent pressure-sensitive-type touch panel prepared on the display 1802, and can perform the item input Sagitta label location input on a display 1802 etc. by pressing the front face with a finger etc.

[0054] It is FM (Frequency Modulation) sound-source section, and 1804 memorizes the music information created by the music editor etc. as digital data to memory 1810 or external storage 1812, it is read from these memory etc. and performs FM modulation. The electrical signal from the FM sound section 1804 is changed into audible sound by the loudspeaker 1805. A printer 1806 is used as a printing terminal of a word processor, a personal computer, facsimile apparatus, and a reproducing unit.

[0055] 1807 is the image reader which reads manuscript data in photoelectricity and inputs them, is prepared into the conveyance path of a manuscript and performs read of the other various manuscripts of a facsimile manuscript or a copy manuscript.

[0056] 1808 is the transceiver section of facsimile transmission of the manuscript data read by the image reader 1807, and the facsimile (FAX) which receives and decodes the sent facsimile signal, and has an interface function with the exterior. 1809 is telephone which has various telephone functions, such as a

usual telephone function, a usual answering machine function, etc.

[0057] 1810 is ROM which memorizes a system program, a manager program other application programs, etc. a character font, a dictionary, etc., the application program loaded from external storage 1812, and document information and the memory which contains a Video RAM etc. further. 1811 is a keyboard which inputs document information, various commands, etc. 1812 is the external storage which uses a floppy (trademark) disk, a hard disk, etc. as a storage, and the application program of document information, music or speech information, and a user etc. is stored in this external storage 1812.

[0058] Drawing 8 is typical general-view drawing of the information processor shown in drawing 7 .

[0059] Among drawing, 1901 are a flat-panel display using the above-mentioned liquid crystal display, and display various menus, graphic form information, document information, etc. On this display 1901, a coordinate input and an item assignment input can be performed by pressing the front face of a touch panel 1803 with a finger etc. 1902 is a hand set currently used when equipment functions as telephone. It connects with the body through the code removable, and a keyboard 1903 can perform various document functions and various data inputs. Moreover, various function key 1904 grades are prepared in this keyboard 1903. 1905 is insertion opening of the floppy disk which is one of the external storage 1812.

[0060] The manuscript which 1906 is the form installation section which lays the manuscript read by the image reader 1807, and was read is discharged from the back of equipment. Moreover, in facsimile reception etc., it is printed by the ink jet printer 1907.

[0061] When functioning considering the above-mentioned information processor as a personal computer or a word processor, the various information inputted from the keyboard 1903 is processed by the control section 1801 according to a predetermined program, and is outputted as an image by the printer 1907.

[0062] Moreover, when functioning as a receiver of facsimile apparatus, according to a predetermined program, reception of the facsimile information inputted from the FAX transceiver section 1808 through the communication line is carried out by the control section 1801, and it is outputted as a receiving image by the printer 1907.

[0063] Moreover, when functioning as a reproducing unit, a manuscript is read, the read manuscript data are sent to a printer 1907 by the image reader 1807 from a control section 1801, and it is outputted as a copy image. In addition, when functioning as a receiver of facsimile apparatus, the manuscript data read by the image reader 1807 are transmitted to a communication line through the FAX transceiver section 1808, after transmitting processing is carried out by the control section 1801 according to a predetermined program.

[0064] In addition, it becomes possible [the information processor mentioned above is good also as one apparatus which built the ink jet printer 1907 in the body, as shown in drawing 9 , and] in this case to raise portable nature more. In this drawing, a corresponding sign is given to the part which has the same function as drawing 8 , and the explanation is omitted.

[0065] [Explanation of the whole configuration of a light filter manufacturing installation] Drawing 13 - drawing 16 are drawings having shown the configuration of an applicable light filter manufacturing installation in this operation gestalt. Drawing 13 is equipment general-view drawing (perspective view) and drawing showing the ink jet head unit (it is also only called a head unit) with which the detail drawing around a stage of equipment and drawing 15 have the ink jet head of equipment, and the plot plan of optical system, and, as for drawing 14 , drawing 16 has two ink jets of each color of RGB at a time, respectively.

[0066] In drawing 13 - drawing 16 , the X-Y stage which a shock absorbing desk for the surface plate for equipment loading and 602 to support a surface plate 601, and for 601 intercept extraneous vibration and 603 are prepared on a surface plate 601, and performs large stroke migration, and 604 are the theta-Z-tilt stages for theta-Z-tilt alignment doubling carried on X-Y stage 603. The glass substrate in which the black matrix and the resin constituent layer were formed by the approach which 605 was carried in the theta-Z-tilt stage 604 and was already mentioned above, and 606 are the head units carried where the ink jet head (120a, 120b, 121a, 121b, 122a, 122b) of R-G-B each two colors of every is relatively positioned with the head positioning fixtures (head installation section) 1000, 1001, and 1002, respectively. The optical system for Z direction detection for the optical system for the direction alignment detection of X and Y-theta for 607 to perform alignment of X of a glass substrate 605, Y, and the direction of theta and 608 (608a, 608b, 608c) to detect a Z direction and 609 are the optical system for the impact location detection for detecting the impact location of the ink breathed out from each ink jet heads 120, 121, and 122. A stanchion for a head stage for 610 to carry out X directional movement of the head unit 606 and 611 to support the head stage 610 and 612 are the head theta motors for being attached in the upper part of the head unit 606, and rotating the whole head unit. 613 is the head support arm in which it was carried in the head stage and the valve box 614 where the head theta motor 612 and the head unit 606 were supported, and the cross valve which is a part of ink supply system, the dissolved oxygen analyzer, etc. were incorporated was carried. By driving the head stage 610, the head unit support arm 613 is movable in the direction of X from the center section of equipment to an edge united with the head unit 606 and the valve box 614. And installation of the head unit 606, exchange, and the positioning activity of an ink jet head (120a, 120b, 121a, 121b, 122a, 122b) can be done by moving the support arm 613, the head unit 606, and the valve box 614 to the edge of the head stage 610. Moreover, in the equipment with which two head units 606 are carried like this operation gestalt, the head stage 610 serves as the device in which the relative position of the direction of X of these two units 606 can be positioned to micron order.

[0067] 615 carries out capping of the nozzle (ink delivery) 132 of an ink jet head, or has the cap for receiving the ink discharged from the nozzle 132, and a wiping blade for wiping away the ink adhering to a nozzle side, and is a recovery system unit movable to just under the head unit 606. A washing system unit for 616 to wash the cap and wiping blade which were incorporated in the recovery system unit 615, The thermal chamber for 617 being constituted so that the whole light filter manufacturing installation may be covered, and managing the temperature inside equipment strictly, 618 is arranged in the thermal chamber 617 and it shows the glass substrate conveyed from the outside of the thermal chamber 617 to a light filter manufacturing installation (carrying in). Moreover, it is a glass substrate carrying-in blowdown device for discharging a glass substrate out of the thermal chamber 617 from a light filter manufacturing installation. 619 is an ink supply system unit for being arranged on the outside of the thermal chamber 617, minding the tube bundle 620 which passes through the hole which was able to be made in the thermal chamber 617, and supplying and discharging ink to the valve box 614. Corresponding to each head unit 606, every one of this ink supply system unit 619 is prepared, respectively. The ink supply system unit 619 is constituted by the Maine ink tank 301 for holding the ink of RGB, the main pump 302, the subink tank 401, and the Maine deaerator 511 grade.

[0068] The ink supply tube 625 and the cable for electrical signals (un-illustrating) are independently connected to each ink jet heads 120a, 120b, 121a, 121b, 122a, and 122b, respectively, and another side of the cable for electrical signals is connected to the control unit (control controller) which consists of

personal computers arranged to the exterior of the thermal chamber 617. These ink jet heads 120a, 120b, 121a, 121b, 122a, and 122b are constituted so that the regurgitation of the ink can be carried out independently, respectively.

[0069] Moreover, it connects with the cross valve in the valve [which is the ink supply tube 625] box 614 by which an end is already constituted from a cross valve, a dissolved oxygen analyzer, etc. through the coupler section 626. From the valve box 614, the cable (un-illustrating) with which the cable for cross valve actuation and the sensor cable of a dissolved oxygen analyzer became a bundle has come out, and it connects with an external control unit through the hole which was able to be made in the thermal chamber 617 like the tube bundle 620.

[0070] Moreover, a dummy substrate (un-illustrating) is carried at the time of rigging of equipment, alignment of X of a substrate, Y, and the direction of theta is performed by the alignment detection system 607, and the pattern for assessment is drawn with the ink jet heads 120, 121, and 122. Furthermore, X-Y stage 603 is moved and an impact location is measured by the impact location detection system 609. The coordinate of the alignment detection system 607 and the coordinate of the impact location of the ink jet heads 120, 121, and 122 can be measured to accuracy by this. In addition, what is necessary is just to perform this coordinate value at the time of equipment assembly, when the system parameters at the time of ink jet head exchange etc. change since it does not change even if it carries another substrate. The impact location is measured with other equipments and this measured value may be made to be reproduced by the light filter manufacturing installation.

[0071] At the time of coloring of a light filter, if the glass substrate 605 for coloring is carried in theta and Z-tilt stage 604, the alignment detection system 607 will detect the amount of gaps of glass substrate 605, ink jet heads 120, 121, and 122X, Y, and theta3 direction. Based on this detection result, theta and Z-tilt stage 604 amends gap of theta component, and gap of the direction of X is amended by performing alignment of the direction of X of X-Y stage 603. Moreover, the regurgitation timing control from the alignment or the ink jet heads 120, 121, and 122 of the direction of Y of X-Y stage 603 performs gap of the direction (main scanning direction) of Y which is the coloring direction. Furthermore, fluctuation of the clearance between a glass substrate 605 and the ink jet heads 120 and 121, and 122 fluctuates an impact location. Therefore, it asks for the clearance and inclination between them by Z detection systems 608a-608c, and it draws with the ink jet heads 120, 121, and 122, controlling so that a clearance becomes fixed. Depending on precision, it may measure and amend at the time of glass substrate loading, and immobilization is sufficient during drawing.

[0072] The ink jet head unit 606 has composition as shown in drawing 16 , and the head positioning fixtures (ink jet head installation section) 1000, 1001, and 1002 are formed corresponding to each color, respectively. This head positioning fixture (ink jet head installation section) is also for determining the relative position between heads and fixing while being for installing two or more ink jet heads. As shown in drawing, two or more ink jet heads of the same color are installed in the one head installation section. Here, although two ink jet heads of the same color are installed at a time to each installation section, the number of the heads to install is not limited to two pieces, and should just be plurality. The 1st ink jet head (120a, 121a, 122a) and the 2nd ink jet head (120b, 121b, 122b) which are installed to each installation section are positioned so that the center line of the nozzle train (ink delivery train) of each head may be in agreement. That is, the both sides of the 1st ink jet head and the 2nd ink jet head are established in the head installation section so that the nozzle train (ink delivery train) of the 1st ink jet

head and the nozzle train (ink delivery train) of the 2nd ink jet head may be located in a line on the same straight line. Moreover, the array direction of two or more ink jet heads is the same direction as the array direction of a nozzle. In addition, although the following explains in detail, it is fixed to the installation section and, on the other hand, the 2nd ink jet head (120b, 121b, 122b) of the 1st ink jet head (120a, 121a, 122a) is movable to the same direction as the array direction of a nozzle. And before coloring of a light filter, the 2nd ink jet head is moved in the direction of a nozzle train, the relative position of the 1st ink jet head and the 2nd ink jet head is adjusted, and the 2nd ink jet head is fixed to the installation section. Thus, after fixing the both sides of the 1st ink jet head and the 2nd ink jet head to the installation section, coloring of a light filter is performed.

[0073] [Configuration of the control controller of a light filter manufacturing installation] Drawing 17 is the block diagram of the control controller (control unit) of the light filter manufacturing installation 90 in this operation gestalt. A personal computer 59 functions as an I/O means of the control controller 58, and a display 62 displays the information about abnormalities, such as a progress situation of manufacture, and existence of head abnormalities. Moreover, a control unit 60 directs actuation of the light filter manufacturing installation 90 etc.

[0074] A controller 58 controls actuation of the light filter manufacturing installation 90, and an interface 65 delivers data between a personal computer 59 and a controller 58. While ROM which has memorized the control program for CPU by which 66 controls the light filter manufacturing installation 90, and 67 to operate CPU, and 68 are used as a work area of CPU and memorizing various data RAM for memorizing the information for adjusting the impact location of the ink breathed out from the information related unusually or each nozzle etc., A regurgitation condition control section for 70 to control the regurgitation of the ink into each filter element of a light filter, It connects with a controller and a stage control section for 71 to control actuation of X-Y stage 603 of the light filter manufacturing installation 90 and 90 show the light filter manufacturing installation which operates according to the directions.

[0075] [Outline configuration of an ink jet head] Next, drawing 18 is drawing showing the structure of the ink jet heads 120, 121, and 122 used for the above-mentioned light filter manufacturing installation. Although the ink jet head is independently prepared corresponding to three colors of R-G-B, respectively, since the head of these three colors is the same structure, respectively, drawing 18 shows the equipment of drawing 13 on behalf of one structure among the heads of RGB3 color. In addition, in drawing 18 , the heater is used as an energy grant means.

[0076] In drawing 18 , the outline configuration of the ink jet head 120 is carried out from the heater board 104 which is the substrate with which two or more heaters 102 for heating ink were formed, and the top plate 106 put on this heater board 104. Two or more deliveries 108 are formed in the top plate 106, and the liquid route 110 on the tunnel which is open for free passage to this delivery 108 is formed behind the delivery 108. Each liquid route 110 is isolated with the next liquid route by the septum 112. In that back, it connects common to one liquid ink room 114, ink supply of each liquid route 110 is carried out through the ink feed hopper 116 at the liquid ink room 114, and this ink is supplied to each liquid route 110 from the liquid ink room 114.

[0077] Alignment of the heater board 104 and the top plate 106 is carried out, and they are assembled by condition like drawing 18 so that each heater 102 may come to the location corresponding to each liquid route 110. Although only two heaters 102 are shown in drawing 18 , the heater 102 is arranged one [at a time] corresponding to each liquid route 110. If a predetermined driving pulse (driving signal) is supplied

to a heater 102 in the condition of having been assembled like drawing 18 , the ink on a heater 102 will boil and air bubbles will be formed. Ink is extruded by the cubical expansion of these air bubbles from a delivery 108, and the ink regurgitation is performed. Therefore, by controlling the driving pulse added to a heater 102, the magnitude of air bubbles can be adjusted and the volume of the ink breathed out from a delivery can be controlled free. In addition, there is power given to a heater as a parameter to control.

[0078] The [control approach of ink discharge quantity] Drawing 19 is drawing for explaining how changing the power applied to a heater to this appearance, and controlling the discharge quantity of ink.

[0079] With this operation gestalt, in order to adjust the discharge quantity of ink, it is made as [impress / to a heater 102 / two kinds of constant-voltage pulses]. As it is indicated in drawing 19 as two pulses, they are a preheating pulse and the Maine heat pulse (only henceforth a heat pulse). A preheating pulse is a pulse for preceding carrying out the regurgitation of the ink actually, and warming ink to predetermined temperature, and is set as the value shorter than the minimum pulse width t5 required in order to carry out the regurgitation of the ink. Therefore, ink is not breathed out by this preheating pulse. A preheating pulse is added to a heater 102 by raising the initial temperature of ink even to fixed temperature for always making regularity ink discharge quantity when impressing a behind fixed heat pulse. Moreover, even when the temperature of ink is adjusted beforehand and the same heat pulse is impressed by adjusting the die length of a preheating pulse conversely, it is also possible to change the discharge quantity of ink. Moreover, it also has the work which brings forward the time standup of the ink regurgitation when impressing a heat pulse, and improves responsibility by warming ink in advance of impression of a heat pulse.

[0080] On the other hand, a heat pulse is a pulse for making ink breathe out actually, and is set up for a long time than the minimum pulse width t5 required in order to carry out the regurgitation of the above-mentioned ink. Since the energy which a heater 102 generates is a thing proportional to the width of face (impression time amount) of a heat pulse, it can adjust the variation in the property of a heater 102 by adjusting the width of face of this heat pulse.

[0081] In addition, spacing of a preheating pulse and a heat pulse is adjusted and it becomes possible also by controlling the diffusion condition of the heat by the preheating pulse to adjust the discharge quantity of ink. Moreover, it is also possible to change the electrical-potential-difference value of electrical-potential-difference PASURU given to a heater (it impresses), namely, to adjust the discharge quantity of ink by changing the driver voltage of a head.

[0082] The discharge quantity of ink can also be controlled by it being also possible to control by adjusting the impression time amount (pulse width) of a preheating pulse and a heat pulse, and adjusting impression spacing of a preheating pulse and a heat pulse so that the above-mentioned explanation may show, and it is also possible to control by adjusting the driver voltage of a head. Therefore, it becomes possible by adjusting the impression time amount of a preheating pulse and a heat pulse, impression spacing of a preheating pulse and a heat pulse, the driver voltage of a head, etc. if needed to adjust the responsibility over the impression pulse of the discharge quantity of ink, or the regurgitation of ink free. When coloring a light filter especially, it is desirable to carry out the abbreviation homogeneity of the coloring concentration (depth of shade) between each filter element and within one filter element, therefore it may control by semantics which controls generating of color nonuniformity to make the same ink discharge quantity from each nozzle. If the ink discharge quantity for every nozzle is the same, since the amount of ink driven into each filter element will also become the same, coloring concentration

between filter elements is made to abbreviation identitas. Moreover, the nonuniformity within one filter element can also be reduced. Therefore, what is necessary is just to control the above-mentioned ink discharge quantity to adjust the ink discharge quantity for every nozzle identically.

[0083] Next, it explains more concretely about the adjustment of ink discharge quantity shown above.

[0084] For example, as shown in drawing 19 , when the same energy is given to each deliveries (nozzle) 108a, 108b, and 108c, the case where the ink discharge quantity from each nozzle differs is explained. In detail, it shall be constant temperature, and when fixed energy is impressed, for the ink discharge quantity of nozzle 108a, the ink discharge quantity of 36pl(s) (pico liter) and nozzle 108b shall be [the ink discharge quantity of 40pl(s) and nozzle 108c] 40pl(s), and the resistance of heater 102c corresponding to 200 ohms and nozzle 108c in the resistance of heater 102b corresponding to heater 102a corresponding to nozzle 108a and nozzle 108b shall be 210ohms. And I want to double all the discharge quantity of each nozzle 108a, 108b, and 108c with 40pl(s).

[0085] Although what is necessary is just to adjust the width of face of a preheating pulse and a heat pulse in order to adjust the discharge quantity of each nozzle 108a, 108b, and 108c to the same amount, various things can be considered about the combination of the width of face of this preheating pulse and a heat pulse. Here, the amount of the energy generated by the heat pulse shall be set up so that it may become the same with three nozzles, and adjustment of discharge quantity shall be performed by adjusting the width of face of a preheating pulse.

[0086] First, what is necessary is just to impress the electrical-potential-difference pulse of the same width of face as Heaters 102a and 102b, in order to make the same energy generated by the heat pulse, since the resistance of heater 102b of heater 102a and nozzle 108b of nozzle 108a is the same 200ohms. t5 which mentioned above the width of face of an electrical-potential-difference pulse here t3 [long] It sets up. On the other hand, Nozzles 108a and 108b are the width of face t1 of the preheating pulse of heater 102b in heater 102a, in order to make [many] discharge quantity of nozzle 108a, since the discharge quantity when adding the same energy differs from 36pl and 40pl(s). t2 [long] A preheating pulse is added. If it does in this way, the discharge quantity of Nozzles 108a and 108b can be arranged with the same 40pl(s).

[0087] On the other hand, since the resistance of heater 102c of nozzle 108c is 210ohms higher than the resistance of other two heaters 102a and 102b, in order to generate the same energy as other two heaters from heater 102c, it needs to lengthen width of face of a heat pulse. Therefore, t3 which mentioned above the width of face of a heat pulse here t4 [long] It has set up. Moreover, it is t1 that what is necessary is just to make it the same as heater 102b since the discharge quantity of the nozzles 108b and 108c when adding fixed energy about the width of face of a preheating pulse is the same. The preheating pulse of width of face is added.

[0088] The same quantity of ink can be made to breathe out from three nozzles 108a, 108b, and 108c from which the ink discharge quantity when adding resistance and fixed energy as mentioned above differs. Moreover, it is also possible to change the discharge quantity of ink intentionally by the same technique. In addition, a preheating pulse is used for decreasing with [of the regurgitation for every nozzle] a rose.

[0089] [Detail configuration of an ink jet head unit] Next, the detailed configuration of an ink jet head unit applicable with this operation gestalt is explained using drawing 20 - drawing 22 . Drawing 20 , drawing 21 , and drawing 22 are the plan showing the configuration of the ink jet head unit 606, a front view, and a side elevation, respectively. As above-mentioned drawing 16 explained, in addition, to the ink

jet head unit 606 Ink jet head 120a and 120b for carrying out the regurgitation of the red (R) ink are installed in the head installation section 1000 (head fixture), and gets down. Ink jet head 121a and 121b for carrying out the regurgitation of the green (G) ink are installed in the head installation section 1001 (head fixture), and gets down. Ink jet head 122a and 122b for carrying out the regurgitation of the blue (B) ink are installed in the head installation section 1002 (head fixture).

[0090] In drawing 16 , moreover, the ink jet head (120, 121, 122) prepared two pieces at a time corresponding to each color of RGB The 1st ink jet head thoroughly fixed to the head installation section (1000, 1001, 1002) (120a, 121a, 122a), It consists of the 2nd ink jet head (120b, 121b, 122b) installed to the 1st ink jet head so that it may be movable in a direction parallel to the direction of a nozzle train. First, as the 1st step, adjustment of the relative position of each ink jet head performs positioning of the 1st ink jet head thoroughly fixed to the head installation section by moving each of the head installation section, and then is performed by adjusting the relative position of the 2nd [to the 1st ink jet head] ink jet head as the 2nd step.

[0091] In drawing 20 - drawing 22 , each head installation sections 1000, 1001, and 1002 are fixed to Arms 851a-851c, Arms 851a-851c are fixed to baffle plates 852a-852c, respectively, and baffle plates 852a-852c are being mutually fixed through fixed blocks 853a and 853c. A micrometer for 854a and 854c to perform alignment of the direction of a nozzle train of the head installation sections 1000 and 1002 (the direction of X) on the basis of the head installation section 1001, and 855a and 855c are based on the head installation section 1001. The micrometer for performing alignment of the hand of cut within a flat surface parallel to a coloring side (X-Y side), The lock screw for fixing the location of the head installation sections 1000 and 1002 to the head installation section 1001, after 856a and 856c perform alignment of said direction of X, 857a and 857c are a lock screw for fixing the relative position of the hand of cut of the head installation sections 1000 and 1002 to the head installation section 1001, after performing alignment of said hand of cut.

[0092] Although each arms 851a-851c and baffle plates 852a-852c consist of a stainless plate with a thickness of about 7mm, baffle plates 852a and 852c form the part (hinge region) 858 which reduced rigidity by the slot and opening into the part near fixed blocks 853a and 853c, and they are constituted centering on the hinge region 858 so that it may be pivotable. It left few parts (deflection section) 862, opening and a slit have separated the arm installation section 861 for baffle plates 852a and 852c to attach Arms 851a and 851c, as further shown in drawing 21 from other parts of baffle plates 852a and 852c, and the arm installation section 861 is made movable to other parts of baffle plates 852a and 852c in the flat surface of drawing 21 .

[0093] In order to perform alignment of the direction of X of the head installation section 1000, lock screw 856a is loosened and micrometer 854a is rotated. Please fix at the head of micrometer 854a according to the hand of cut, along with the guide 864 with which the rust 863 was fixed to baffle plate 852a, it moves to the upper and lower sides (Z direction) in drawing 21 , and the metallic ornaments 865 which are in slide contact with the slant face of a wedge 863 move to the right or the left (the direction of X) in drawing 21 . Since metallic ornaments 865 are being fixed in the direction of X by the movable arm installation section 861 to other parts of baffle plate 852a, when metallic ornaments 865 move in the direction of X, the head installation section 1000 moves in the direction of X to the head installation section 1001, and alignment is relatively carried out. After alignment fixes the location of the arm installation section 861 in baffle plate 852a for lock screw 856a in total. The spring 866 is energizing metallic ornaments 865

rightward in drawing 21 in order to return the arm mounting section 861 rightward in drawing 21 , when a wedge 863 goes up.

[0094] In order to perform parallel **** of ink jet head 120a of the hand-of-cut location 1000 within a field parallel to the coloring side of the head installation section 1000, i.e., the head installation section, and ink jet head 121a of the head installation section 1001, lock screw 857a is loosened and micrometer 855a is rotated. Please fix at the head of micrometer 854a according to the hand of cut, along with the guide 872 with which the rust 871 was fixed to baffle plate 852b, it moves to the upper and lower sides (Z direction) in drawing 22 at baffle plate 852b and parallel, and the metallic ornaments 873 which are in slide contact with the slant face of a wedge 871 move to the right or the left (the direction of X) in drawing 22 . Metallic ornaments 873 are being fixed to the head side (a fixed block 853 side, opposite side) of baffle plate 852a. Since the head side is constituted pivotable centering on the hinge region 858 to the fixed block 853, baffle plate 852a When metallic ornaments 873 move in the direction of Y, ink jet head 120a of the head installation section 1000 rotates in a flat surface parallel to a X-Y flat surface to ink jet head 121a of the head installation section 1001. The alignment of a hand of cut, i.e., parallel **** with ink jet head 120b, is performed. After alignment fixes the location of said hand of cut of baffle plate 852a [as opposed to baffle plate 852b for lock screw 857a] in total. A spring 874 is for returning the head side of baffle plate 852a to baffle plate 852b approach, when a wedge 871 goes up.

[0095] Baffle plate 852c as well as baffle plate 852a is constituted, and alignment is similarly carried out to baffle plate 852b. In addition, the alignment of the direction (the direction of X) which intersects perpendicularly with the coloring direction (the direction of Y) of ink jet head 120a of the head installation section 1000, and ink jet head 121a of the head installation section 1001 in ****, Although the alignment of the hand of cut (circumference of the shaft of a Z direction) within a flat surface parallel to a coloring side (X-Y side) was explained When the alignment of a Z direction attaches in a baffle plate the arms 851a-851c which fixed the head installation sections 1000-1002 at 852a-852c at the time of unit assembly, It carries out by pressing the datum plane of the head installation sections 1000-1002 against the fixture which consists of a hyperplane, and tightening the installation screw 868. The height of the nozzle side of each ink jet heads 120a, 120b, 121a, 121b, 122a, and 122b is positioned so that it may become fixed height from the datum level of each head installation sections 1000, 1001, and 1002.

[0096] As mentioned above, an assembly and the ink jet head unit 606 which carried out alignment use the screw holes 859 and 860 of drawing 20 for the base of the head theta motor 612 of a light filter manufacturing installation shown in drawing 13 , hangs them on it, and is fixed to it.

[0097] [Configuration of the head installation section] Next, the detailed configuration of the head installation sections (head fixture) 1000, 1001, and 1002 is explained, referring to drawing 23 .. In addition, since each head installation sections 1000, 1001, and 1002 have the same configuration, they decide that only the configuration of the one installation section 1000 of them is shown in drawing 23 .

[0098] While 1st ink jet head 120a is fixed, 2nd ink jet head 120b is arranged at the head installation section 1000 so that the nozzle train of 1st ink jet head 120a and the nozzle train of 2nd ink jet head 120b may serve as a straight line. Moreover, the actuator 123 by the piezo-electric element is attached in the head installation section 1000, and ink jet head 120b of the above 2nd can be moved in the direction of a nozzle train by operating this actuator 123. That is, the above-mentioned actuator functions as a positioning means of the direction of a nozzle train of a head, and it becomes possible by having this positioning means 123 (actuator) to perform positioning of the direction of a nozzle train of 2nd ink jet

head 120b.

[0099] It faces positioning 2nd ink jet head 120b on the head installation section 1000, and it is controlling by this operation gestalt so that spacing of the 1st nozzle (120 a-N1) of 1st ink jet head 120a and the 1st nozzle (120 b-N1) of 2nd ink jet head 120b turns into a pitch twice [natural number] the distance of a nozzle, and spacing for 200 nozzles. The electrical-potential-difference value applied to the actuator 123 by the piezo-electric element is changed so that the 1st nozzle of each head, i.e., the distance of 120 a-N1 and 120 b-N1, may specifically serve as a predetermined distance (distance which is N times the nozzle pitch) set up beforehand. In connection with the electrical-potential-difference value impressed to an actuator 123 changing, the movement magnitude of the 2nd ink jet head also changes. If the electrical-potential-difference value impressed to an actuator is enlarged, the movement magnitude of the 2nd ink jet head will also become large that much, and on the other hand, if the electrical-potential-difference value impressed to an actuator is made small, the movement magnitude of the 2nd ink jet head will also become small that much. In addition, what is necessary is for the electrical potential difference impressed to an actuator not to impress continuously till the coloring initiation by the ink jet head, and just to make it impress an electrical potential difference again, when a head unit is equipped with applying an electrical potential difference by a stop and the light filter manufacturing installation, once the electrical-potential-difference value which should be impressed was determined. Thereby, ink jet head 120b can be adjusted to a desired location to ink jet head 120a. In addition, with the 1st nozzle (120 a-N1) of the 1st ink jet head, it is the thing of a nozzle located in the furthest distance from 2nd ink jet head 120b, and the 1st nozzle (120 b-N1) of the 2nd ink jet head is a nozzle located in the nearest distance from 1st ink jet head 120b.

[0100] The physical relationship of the 1st ink jet head and the 2nd ink jet head is determined as mentioned above. In addition, although the actuator by the piezo-electric element was mentioned as the example and explained as a positioning means to move the 2nd ink jet head in the direction of a nozzle train, it may not be limited to this and an air pressure-type actuator may be used. Namely, in this operation gestalt, an applicable positioning means moves an ink jet head in the direction of a nozzle train, and just performs positioning of the direction of a nozzle train of an ink jet head on the head installation section. Moreover, although the relative position of the 1st ink jet head and the 2nd ink jet head is determined in the above so that spacing of the 1st nozzle (120 a-N1) of the 1st ink jet head and the 1st nozzle (120 b-N1) of the 2nd ink jet head may become twice [natural number] a nozzle pitch, the adjustment approach of the relative position in this operation gestalt is not limited to this. For example, you may adjust so that spacing of the m-th nozzle (120 a-Nm) (m is the natural number) of the 1st ink jet head and the m-th nozzle (120 b-Nm) of the 2nd ink jet head may become twice [natural number] a nozzle pitch. Namely, what is necessary is just to adjust the relative position of two heads in this operation gestalt, so that the distance between the nozzle of the arbitration of the 1st ink jet head and the nozzle of the arbitration of the 2nd ink jet head may become twice [natural number] a nozzle pitch.

[0101] Thus, so that the nozzle train of 1st ink jet head 120a and the nozzle train of 2nd ink jet head 120b may serve as a straight line And so that spacing (distance between the nozzle of the arbitration of the 1st ink jet head and the nozzle of the arbitration of the 2nd ink jet head) of the nozzle of the arbitration of said two ink jet heads may become twice [natural number] a nozzle pitch By arranging the 1st ink jet head and the 2nd ink jet head on the head installation section 1000, and fixing, the head unit possessing two ink jet heads of the same color is completed. Since spacing of two ink jet heads (the 1st ink jet head

and 2nd ink jet head) is set up the natural number twice of a nozzle pitch, even if it is the light filter of what kind of pixel pitch, two or more light filters of a class can be manufactured by being able to make the location of a nozzle, and the location of a pixel in agreement by rotating a head unit equipped with the head installation section, consequently using this head unit. Moreover, since two heads of the same color possess in one head unit, large compaction of production time can be aimed at compared with the head of the same color manufacturing a light filter in the head unit only possessing one. In addition, drawing 24 is drawing having shown signs that only theta rotated the ink jet head according to the pixel pitch of a light filter. What is necessary is just to adjust the include angle of a head, when using the ink jet head of the nozzle pitch which is not in agreement with a pixel pitch. For example, when performing include-angle adjustment of R head (120a, 120b), only theta rotates R head so that the nozzle pitch of the direction of X of R head and the pitch of the pixel train of R color which adjoins in the direction of X may be in agreement. By carrying out like this, the nozzle location of R head and the pixel location of R color can be in agreement, and R head can color each pixel train now. Moreover, what is necessary is just to make in agreement the distance and the pixel pitch of the direction of X of every K nozzle, when it is not limited to this, for example, colors a light filter, using the nozzle of R head every K (K is the natural number) nozzle although the adjoining distance and the pixel pitch of the direction of X of a nozzle are made in agreement in drawing 24 . [of a nozzle]

[0102] [Coloring actuation of a light filter] Next, the coloring actuation in the case of coloring a light filter actually using the head unit 606 equipped with the head installation sections 1000, 1001, and 1002 for RGB is explained. Here, the light filter manufacturing installation which shows the head unit 606 to drawing 13 is equipped, and the case where this manufacturing installation colors the light filter is explained, referring to the flow chart of drawing 25 .

[0103] First, in step S1, a light filter manufacturing installation is equipped with the head unit 606, and spacing of the 1st ink jet head (120a, 121a, 122a) and the 2nd ink jet head (120b, 121b, 122b) is adjusted by impressing the electrical-potential-difference value calculated beforehand to an actuator (positioning means). As mentioned above, the distance between the nozzle of the 1st ink jet head and the nozzle of the 2nd ink jet head is adjusted so that it may be N times (N is the natural number) the nozzle pitch. In addition, when a light filter manufacturing installation is equipped with a head unit, by impressing the above-mentioned electrical-potential-difference value memorized beforehand to a positioning means, the distance between the heads adjusted once is reproduced and adjustment of the relative position of the 1st ink jet head and the 2nd ink jet head is performed.

[0104] Next, in step S2, as shown in drawing 26 , the whole head unit 606 is rotated, and the pixel pitch of a light filter and the nozzle pitch of the direction of X of an ink jet head are made in agreement. In this operation gestalt, it is made to rotate focusing on G head (121aand121b), and adjusts to an include angle from which coloring of the pixel on a substrate is attained by the nozzle of G head (121aand121b). Moreover, after angle of rotation of the whole head unit, i.e., angle of rotation of G head, is set up, angle of rotation of R head and B head is adjusted to G head. In this case, angle of rotation is determined that the nozzle pitch of any head of the direction of X will correspond with a pixel pitch.

[0105] Next, as shown in drawing 26 , in order to enable coloring of the pixel on a substrate in step S3 also by R head (120aand120b) and B head (122aand122b) Each head installation sections 1000 and 1002 in which each of R head (120aand120b) and B head (122aand122b) is installed are moved in the array direction of a nozzle, and positioning of the head installation section is performed. The alignment of a

head and a substrate is completed by performing the process of the above-mentioned step S1 - step S3. Although it is also possible for performing the above adjustment to color a light filter, in order to reduce generating of defects, such as color mixture and a white omission, more and to manufacture a higher definition light filter, it is desirable to perform further positioning. Suppose that a process as shown at the following step S4 - step S6 is performed further with this operation gestalt.

[0106] Next, in step S4, ink is breathed out towards a substrate from each nozzle of two or more ink jet heads, and the pattern for impact positioning is created. in addition, the substrate which prepared the ink absorbing layer on the glass substrate which has BM is sufficient as the substrate used by ****** -- carrying out -- base -- the substrate which prepared the ink absorbing layer on the glass substrate may be used.

[0107] Next, in step S5, the pattern for impact positioning is read and it judges whether gap has arisen in the impact location. If gap has not arisen in an impact location, since it means that positioning was performed correctly, positioning of a head and a substrate is ended now. And it progresses to step S7, ink is breathed out from each head, and coloring of a light filter is started.

[0108] On the other hand, at step S5, when gap has arisen in the impact location, it progresses to step S6 and positioning is performed again. At this step S6, gap of an impact location is lost by readjusting at least one of the range adjustment between the heads on the head installation section (adjustment of step S1), include-angle adjustment (adjustment of step S2) of a head unit, and adjustments (adjustment of step S3) of the direction of a nozzle train of the head installation section. If location gap is lost by readjustment, it will progress to step S7 and coloring of a light filter will be started.

[0109] in addition, this operation gestalt shown with the flow chart of drawing 25 -- setting -- the 1st ink jet head (120a --) Although readjustment of spacing of 121a, 122a, and the 2nd ink jet head (120b, 121b, 122b) is performed at the step S6 after include-angle adjustment of a head unit and positioning of the head installation section are completed Before this readjustment performs include-angle adjustment of a head unit and positioning of the head installation section, it may be made to perform it. That is, after termination of step S1 of drawing 25 , on a substrate, ink is breathed out, the pattern for impact positioning is created, and the pattern is read. And you may make it readjust the distance between heads based on the reading result. By carrying out like this, range adjustment between the heads on the head installation section can be performed more to a precision, and distance between heads can be certainly made into a desired distance.

[0110] By establishing the positioning device in which each spacing of two or more ink jet heads installed in the one head installation section can be adjusted easily as mentioned above according to this example of an operation gestalt Even if it makes the number of activity heads increase, positioning between heads can be performed easily. Consequently, fear of the protraction of the time amount which the alignment of a head takes produced by making the number of heads increase is lost, and the effectiveness of compaction of the production time obtained by making the number of activity heads increase can fully be employed efficiently. Moreover, since the light filter is colored using the head unit possessing two or more heads of the same color, as compared with the former, the field which can be colored at once can also shorten breadth and its part coloring time amount. Moreover, even if it is a large-sized substrate, a light filter can be manufactured that what is necessary is just to make the number of part heads to which the substrate became large increase, without this causing lowering of productivity.

[0111] (2nd operation gestalt) Although the operation gestalt of the above 1st explained the case where

the nozzle pitch of two ink jet heads (the 1st ink jet head and 2nd ink jet head) was equal, this 2nd operation gestalt explains the case where the nozzle pitches of two ink jet heads differ. In addition, since others are the same as the operation gestalt of the above 1st, they omit explanation.

[0112] With this operation gestalt, the number of nozzles explains the case where 200 pieces and a nozzle pitch use a 300 micrometers (= 0.3mm) ink jet head with a design value. In this case, spacing of the nozzle of ends is 59.700mm (=(200-1) x0.3mm) in a design value. However, if the nozzle pitch of an ink jet head is measured actually, about **50-micrometer variation may have arisen to the design value. That is, an actual measurement may differ in within the limits which is 59.650-59.750mm. The variation the above-mentioned variation is large and is [variation] about **50 micrometers may produce especially the ink jet head from which a manufacture lot differs.

[0113] Here, it is assumed that the distance between the nozzles of the ends of 1st ink jet head 120a was 59.650mm, and the distance between the nozzles of the ends of 2nd ink jet head 120b was 59.750mm. At this time, the average nozzle pitch of the 1st ink jet head is set to 299.749 micrometers (= 59.650x100/(200-1) mum). When manufacturing a light filter as shown in drawing 10 using such 1st and 2nd ink jet heads, in order to make in agreement the pixel pitch of 264 micrometers, and the nozzle pitch of the direction of X, it is theta=COS about theta whenever [angle-of-inclination / of a head]. It may be necessary to be 1(264/299.749) = 28.26852756 degrees. Moreover, at this time, spacing in the direction of X of the nozzle of the ends of 1st ink jet head 120a is equal to the natural number twice of a pixel pitch (264 micrometers), and has become 52.536mm (=264/100x(200-1) mm).

[0114] Moreover, since 2nd ink jet head 120b is installed in the same head installation section as 1st ink jet head 120a, theta of it is [whenever / angle-of-inclination / of a head] the same as that of 1st ink jet head 120a. If this is taken into consideration, spacing in the direction of X of the nozzle of the ends of 2nd ink jet head 120b will be set to 52.624074mm (=59.750xCOS28.26852756"mm). It turns out that the difference among 88.074 micrometers (=100x(52.624-52.536) mm) has produced this as compared with spacing of 52.536mm in the direction of X of the nozzle of the ends of 1st ink jet head 120a.

[0115] If it colors using the head unit which the 88.074-micrometer difference has produced as mentioned above, poor coloring will occur in a pixel. They are one third of die length. namely, the die length of 88.074 micrometers -- about [of a pixel pitch (264 micrometers)] -- If it colors as it is, though the 1st nozzle (120 b-N1: nozzle nearest to the 1st ink jet head) of 2nd ink jet head 120b can carry out the regurgitation of the ink to the pixel of a corresponding color The 200th nozzle (120 b-N200: furthest nozzle from the 1st ink jet head) cannot carry out the regurgitation of the ink to the pixel which should color with the nozzle essentially. Instead, the regurgitation of the ink will be carried out to the pixel which adjoins the pixel which should be carried out this arrival color. Thus, if each nozzle pitches of two heads installed in the same head installation section differ, it becomes impossible to carry out the regurgitation of the ink to a desired part, and trouble will be caused to manufacture of a light filter. In order to avoid this evil, the variation in a nozzle pitch needs to install a comparable ink jet head to the same head installation section. Although it is an ideal form that a nozzle pitch originally uses the same head, since variation surely arises in the case of manufacture of a head, it is difficult for a nozzle pitch to manufacture the same head thoroughly. Then, with this operation gestalt, even if it is the case where nozzle pitches differ, the variation alpha of a nozzle pitch supposes at the same head installation section that only the head which is within the limits of predetermined will be sorted out and used so that a high definition light filter can be manufactured. When each number of nozzles of m2, the 1st [said] ink jet head, and the 2nd ink jet

head is specifically set [the average value of the ink delivery pitch of said 1st ink jet head] to n for the average value of m1 and the ink delivery pitch of the 2nd [said] ink jet head, The variation alpha of a nozzle pitch (=|m1(n-1)-m2(n-1)|) 0<alpha=|m1(n-1)-m2(n-1)|(micrometer) <=5 -- desirable -- 0 -- < -- alpha=|m1(n-1)-m2(n-1)|(micrometer) <=2 and the head which is within the limits of 0<alpha=|m1(n-1)-m2(n-1)|(micrometer) <=1 more preferably are used. if it puts in another way -- the difference alpha of spacing (distance) of the ends of the activity nozzle (ink delivery to be used) of the 1st ink jet head, and spacing (distance) of the ends of the activity nozzle (ink delivery to be used) of the 2nd ink jet head -- 0< alpha (micrometer)<=5 -- 0< alpha (micrometer)<=2 and the head which is within the limits of 0< alpha (micrometer)<=1 more preferably are used preferably. That is, when installing the head of N individual in the same head installation section, it constitutes so that the difference of the nozzle pitch of the ends of each activity nozzle of the head of N individual may become above-mentioned within the limits.

[0116] In addition, the range of the variation in this nozzle pitch will be range set up so that the regurgitation of the ink could be carried out to a desired location, even if various variations, such as variation in the positioning accuracy of the variation (variation in substrate) stage of the width of face of variation and the water-repellent section and the location of the variation in the impact location to a nozzle location and the diameter of a dot which reached the target, exist. Thus, the above-mentioned variation alpha is determined in consideration of errors, such as variation in the positioning accuracy of the variation (variation in substrate) stage of the width of face of variation and the water-repellent section and the location of the variation in the impact location to a nozzle location, and the diameter of a dot which reached the target, and if it is this within the limits, it can also manufacture the light filter with which pixel pitches differ.

[0117] According to this example of an operation gestalt, the variation in a nozzle pitch can reduce generating of poor coloring of a pixel by installing a comparable head in the same head installation section as mentioned above. Moreover, even if it is the head from which a nozzle pitch differs, manufacture of the light filter with which pixel pitches differ is attained by making variation in a nozzle pitch into predetermined within the limits.

[0118] (Other operation gestalten) In addition, by this invention, it is the range which does not deviate from the main point, and can apply to what corrected or transformed the above-mentioned operation gestalt. For example, although the panel which prepared the light filter in the TFT array side in recent years also exists, the light filter which this description defines is the colored body colored by color material, and is not applied to whether it is in the TFT side, but both include it.

[0119] Moreover, it may be fixed to the head installation section and the positioning means for performing positioning of the direction of a nozzle train of an ink jet head may be fixed to the ink jet head. That is, it is fixed to the head installation section or an ink jet head, and the positioning means should just be installed movable to another side.

[0120] Moreover, any of three pieces, four pieces, and five piece -- are sufficient as the ink jet head of the same color installed in the one head installation section. That is, what is necessary is just plurality. Since the field which can be colored at once spreads the more the more the number of the ink jet heads installed in the head installation section increases, shortening of production time can be attained.

[0121] Moreover, what is necessary is just to constitute so that a positioning means may be formed in the 2nd head and 3rd head, respectively when preparing three ink jet heads (the 1st - the 3rd head) in the

head installation section. namely, what is necessary is just to constitute so that the 2nd · the Nth head may boil a positioning means, respectively and it may be established when preparing the head (the 1st · the Nth head) of N individual

[0122] Moreover, although one ink jet head is fixed among two or more ink jet heads installed in the head installation section, you may constitute from an above-mentioned operation gestalt so that it may not be limited to this and the head currently fixed may not exist. That is, corresponding to all ink jet heads, a positioning means may be established, respectively, and you may constitute so that all ink jet heads can be justified.

[0123] Moreover, although the both sides of the 1st ink jet head and the 2nd ink jet head are established in the head installation section with the above-mentioned operation gestalt so that the nozzle train (1st ink delivery train) of the 1st ink jet head and the nozzle train (2nd ink delivery train) of the 2nd ink jet head may be located in a line on the same straight line, this invention is not limited to this. For example, even if it does not rotate a head, when coloring of a light filter is possible, head arrangement as shown in drawing 27 is sufficient [the nozzle pitch of a head may be the integral multiple of the pixel pitch of a light filter and]. Namely, what is necessary is just to install both heads so that the 1st nozzle train (ink delivery train) and the 2nd nozzle train (ink regurgitation train) may serve as the same direction.

[0124] Moreover, coloring actuation of a light filter may be performed by fixing an ink jet head and moving a stage, and may be performed by fixing a stage and moving an ink jet head.

[0125] Moreover, although the manufacturing installation of the light filter shown above carries two head units, the number of head units may not be limited to two, one is sufficient as it, and three or more are sufficient as it. The time amount which positioning of the relative position between each ink jet head and a head unit takes is short, and ends, and control is also so easy time amount that there are few head units. On the other hand, since the number of nozzles which can be used for coloring increases so that there are many head units, in one relative scan of a head and a substrate, the field which can be colored leads to compaction of breadth and coloring time amount.

[0126] Moreover, although the above-mentioned operation gestalt explained the case where the bubble jet type thing which used the electric thermal-conversion object as an energy generation component (energy grant means) was used, the piezo jet type which gives mechanical oscillation or a variation rate to ink using a piezoelectric device, for example is usable [this invention], without being limited to this.

[0127] Although especially this invention explained the printing equipment of the method which it has [method] means (for example, an electric thermal-conversion object, a laser beam, etc.) to generate heat energy as energy used in order to make the ink regurgitation perform, and makes the change of state of ink occur with said heat energy also in an ink jet recording method, according to this method, it can attain the densification of record, and highly minute-ization.

[0128] About the typical configuration and typical principle, what is performed using the fundamental principle currently indicated by the U.S. Pat. No. 4723129 description and the 4740796 description, for example is desirable. Although this method is applicable to both the so-called mold on demand and a continuous system On the electric thermal-conversion object which is especially arranged corresponding to the sheet and liquid route where the liquid (ink) is held in the case of the mold on demand By impressing at least one driving signal which gives the rapid temperature rise which supports recording information and exceeds film boiling Since make an electric thermal-conversion object generate heat energy, the heat operating surface of a recording head is made to produce film boiling and the air bubbles

in the liquid (ink) corresponding to this driving signal can be formed by 1 to 1 as a result, it is effective. A liquid (ink) is made to breathe out through opening for regurgitation by growth of these air bubbles, and contraction, and at least one drop is formed. If this driving signal is made into a pulse configuration, since growth contraction of air bubbles will be performed appropriately instancy, the regurgitation of a liquid (ink) excellent in especially responsibility can be attained, and it is more desirable.

[0129] As a driving signal of this pulse configuration, what is indicated by the U.S. Pat. No. 4463359 description and the 4345262 description is suitable. In addition, if the conditions indicated by the U.S. Pat. No. 4313124 description of invention about the rate of a temperature rise of the above-mentioned heat operating surface are adopted, further excellent record can be performed.

[0130] The configuration using the U.S. Pat. No. 4558333 description and U.S. Pat. No. 4459600 description which indicate the configuration arranged to the field to which a delivery which is indicated by each above-mentioned description, a liquid route, and the heat operating surface other than the combination configuration (a straight-line-like liquid flow channel or right-angle liquid flow channel) of an electric thermal-conversion object are crooked as a configuration of a recording head is also included in this invention. In addition, it is good also as a configuration based on JP,59-138461,A which indicates the configuration whose opening which absorbs the pressure wave of JP,59-123670,A which indicates the configuration which uses a common slot as the discharge part of an electric thermal-conversion object to two or more electric thermal-conversion objects, or heat energy is made to correspond to a discharge part.

[0131] Furthermore, it is good also as a configuration which fills the die length with the combination of two or more recording heads which are indicated by the description mentioned above as a recording head of the full line type which has the die length corresponding to the maximum width of a light filter substrate.

[0132] In addition, the recording head of the exchangeable chip type with which the electric connection with the body of equipment and supply of the ink from the body of equipment are attained, or the recording head of the cartridge type with which the ink tank was formed in the recording head itself in one may be used by a light filter manufacturing installation body being equipped.

[0133] Moreover, since effectiveness of this invention is further made to stability, it is desirable to add the recovery means against a recording head established as a configuration of the light filter manufacturing installation of this invention, a preliminary auxiliary means, etc. If these are mentioned concretely, it is effective in order to perform record stabilized by performing the preheating means by the capping means, the cleaning means, the application of pressure or the attraction means, the electric thermal-conversion object, the heating elements different from this, or such combination over a recording head, and reserve regurgitation mode in which the regurgitation different from record is performed.

[0134] In the gestalt of operation of this invention explained above, although ink is explained as a liquid, even if it is ink solidified less than [a room temperature or it], what is softened or liquefied at a room temperature may be used, and ink should just make the shape of liquid at the time of activity record signal grant.

[0135] In addition, in order to prevent positively by making the temperature up by heat energy use it positively as energy of the change of state from a solid condition to the liquid condition of ink, or in order to prevent evaporation of ink, the ink which solidifies in the state of neglect and is liquefied with heating may be used. Anyway, ink liquefies by grant according to the record signal of heat energy, and this invention can be applied also when using the ink of the property which will not be liquefied without grant

of heat energy, such as that by which liquefied ink is breathed out, and a thing which it already begins to solidify when reaching a record medium. In such a case, ink is good for a porosity sheet crevice or a breakthrough which is indicated by JP,54-56847,A or JP,60-71260,A also as liquefied or a gestalt which counters to an electric thermal-conversion object in the condition of having been held as a solid. In this invention, the most effective thing performs the film-boiling method mentioned above to each ink mentioned above.

[0136]

[Effect of the Invention] It becomes possible to be able to perform positioning between heads easily by establishing the positioning device in which each spacing of two or more ink jet heads installed in the one head installation section can be adjusted easily according to this invention, even if it makes the number of activity heads increase as explained above, consequently to aim at improvement in the productivity by the increment in the number of heads. Since it becomes possible to manufacture a light filter using the head unit possessing two or more ink jet heads of the same color, the field which can be colored at once becomes large compared with the former, and the part production time can be shortened. Moreover, even if it is a large-sized substrate, a light filter can be manufactured that what is necessary is just to make the number of part heads to which the substrate became large increase, without this causing lowering of productivity.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing having shown an example of the production process of a light filter.
[Drawing 2] It is drawing having shown an example of the production process of a light filter.
[Drawing 3] It is drawing having shown an example of the production process of a light filter.
[Drawing 4] It is the sectional view showing an example of the basic configuration of the color liquid crystal display incorporating the light filter of 1 operation gestalt.
[Drawing 5] It is the sectional view showing an example of the basic configuration of the color liquid crystal display incorporating the light filter of 1 operation gestalt.
[Drawing 6] It is the sectional view showing an example of the basic configuration of the color liquid crystal display incorporating the light filter of 1 operation gestalt.
[Drawing 7] It is the block diagram showing the outline configuration at the time of applying a liquid crystal display to an information processor.
[Drawing 8] It is drawing having shown the information processor with which a liquid crystal display is used.
[Drawing 9] It is drawing having shown the information processor with which a liquid crystal display is used.
[Drawing 10] It is drawing having shown an example of the pattern of the light filter which can be manufactured by this invention.
[Drawing 11] It is drawing having shown the size (size of a screen) of the display when building into a TFT-liquid-crystal panel the light filter manufactured in this invention.
[Drawing 12] It is drawing having shown the example of the color pattern which can be manufactured by this invention.
[Drawing 13] It is general-view drawing (perspective view) showing the configuration of 1 operation gestalt of a light filter manufacturing installation.
[Drawing 14] It is the detail drawing around a stage of a light filter manufacturing installation.
[Drawing 15] They are the ink jet head of a light filter manufacturing installation, and the plot plan of optical system.
[Drawing 16] It is the outline block diagram of an ink jet head unit.
[Drawing 17] It is drawing showing the configuration of the control section which controls actuation of the manufacturing installation of a light filter.
[Drawing 18] It is drawing showing the structure of the ink jet head used for the manufacturing

installation of a light filter.

[Drawing 19] It is drawing having shown the voltage waveform impressed to the heater of an ink jet head.

[Drawing 20] It is the plan showing the configuration of the ink jet head unit 606.

[Drawing 21] It is the front view showing the configuration of the ink jet head unit 606.

[Drawing 22] It is the side elevation showing the configuration of the ink jet head unit 606.

[Drawing 23] It is drawing having shown the detailed configuration of the head installation section.

[Drawing 24] It is drawing having shown signs that only theta rotated the ink jet head according to the pixel pitch of a light filter.

[Drawing 25] It is the flow chart which shows coloring actuation of the light filter in the 1st operation gestalt.

[Drawing 26] It is drawing having shown the situation of the alignment of a head and a substrate.

[Drawing 27] It is drawing having shown an example of the configuration method of the ink jet head installed in the head installation section.

[Description of Notations]

1 Light Transmission Nature Substrate

2 Black Matrix

3 Resin Constituent Layer

4 Photo Mask

5 Non-Coloring Section

8 Protective Layer

12 Septum

14 Hardening Ink

30 Resin Constituent Layer

46 Coloring Section

54 Light Filter

58 Controller

59 Teaching Pendant (Personal Computer)

60 Keyboard

65 Interface

66 CPU

67 RAM

68 ROM

70 Regurgitation Control Section

71 Stage Control Section

90 Light Filter Manufacturing Installation

108 Nozzle

120 Ink Jet Head (R Head)

121 Ink Jet Head (G Head)

122 Ink Jet Head (B Head)

123 Positioning Means

603 X-Y Stage

604 Tilt Stage

605 Glass Substrate
606 Ink Jet Head Unit
609 Optical System for Impact Location Detection
610 Head Stage
612 Head Theta Motor
613 Support Arm
1000 Head Installation Section (Head Fixture for R)
1001 Head Installation Section (Head Fixture for G)
1002 Head Installation Section (Head Fixture for B)

[Translation done.]